



WORCESTER REGIONAL RETIREMENT SYSTEM

ACTUARIAL VALUATION as of

January 1, 2016

Prepared by:

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December 5, 2016

Worcester Regional Retirement Board
Midstate Office Park
23 Midstate Drive, Suite 106
Auburn, MA 01501

Dear Board Members:

We are pleased to present the enclosed report summarizing the results of our actuarial valuation of the Worcester Regional Retirement System as of January 1, 2016.

Our valuation was performed in accordance with the provisions contained in Chapter 32 of the Massachusetts General Laws, "M.G.L.", as of January 1, 2016. Disclosures under GASB Statement No. 67, Financial Reporting for Pension Plans (GASB 67) and GASB Statement No. 68, Accounting and Financial Reporting for Pensions (GASB 68) are provided in a separate report.

The principal results of our valuation are summarized in Section 2. The summary of Plan provisions and actuarial methods and assumptions are shown in Sections 5 and 6, respectively. Section 7 summarizes the demographic profile of active members and retired plan members. Asset information and actuarial liabilities are presented in Section 2. The development of the required appropriations pursuant to Chapter 32 of the M.G.L. is shown in Section 3. The summary of information for PERAC is presented in Section 4.

We also provide a 30-year forecast of the required appropriations and cash flows in Section 3.

Our actuarial valuation is based on an investment return rate of 7.75%, compounded annually. Our calculations were based on participant census and asset data and other information provided by the Worcester Regional Retirement System and the benefit provisions of Chapter 32 of the M.G.L. as of January 1, 2016.

K M S A C T U A R I E S

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Our valuation follows generally accepted actuarial methods and we perform such tests as we consider necessary to assure the accuracy of the results. The amounts presented in this report have been appropriately determined according to the actuarial assumptions and methods stated herein.

We appreciate this opportunity to be of service to the Worcester Regional Retirement Board. We are available to answer any questions with respect to our valuation.

Respectfully submitted,

A handwritten signature in black ink, reading "Linda Bournival". The signature is written in a cursive style with a large, looped "L" and a long, sweeping "B".

Linda L. Bournival, FSA
Member, American Academy of Actuaries

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ACTUARIAL CERTIFICATION

This report presents the results of the Actuarial Valuation for the Worcester Regional Retirement System as of January 1, 2016. The report presents the funding schedule contribution amounts for the fiscal years beginning 2018.

This valuation is based upon member data provided by the Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Worcester Regional Retirement System. Although we did not audit the data used in the valuation, we believe that the information is complete and reliable.

Future actuarial valuation results may differ significantly from the current results presented in this report. Examples of potential sources of volatility include plan experience differing from that anticipated by the economic or demographic assumptions, the effect of new entrants, changes in economic or demographic assumptions, the effect of law changes and the delayed effect of smoothing techniques.

This report was completed in accordance with generally accepted actuarial standards and procedures, and conforms to the Code of Professional Conduct of the American Academy of Actuaries. The actuarial assumptions used in the determination of costs are reasonably related to the experience of the System and to reasonable expectations, and represent our best estimate of anticipated long-term experience under the System.

This report is intended for the sole use of the Worcester Regional Retirement System and is intended to provide information to comply with the stated purpose of the report. It may not be appropriate for other purposes.

The undersigned credentialed actuaries are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinion contained herein. They are available to answer any questions with regard to this report.

Respectfully submitted,



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SECTION 1 - SUMMARY

Background

We have completed the Actuarial Valuation of the Worcester Regional Retirement System as of January 1, 2016. This valuation is based upon census data provided by the Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Worcester Regional Retirement Board. Information for the prior valuation completed as of January 1, 2014 was obtained from the valuation report prepared by KMS Actuaries, LLC.

Massachusetts General Laws

The valuation was prepared in accordance with Chapter 32 of the Massachusetts General Laws ("M.G.L."). The results are based on the active, inactive and retired members and beneficiaries as of January 1, 2016, the assets as of December 31, 2015 and assumptions regarding investment returns, salary increases, death, turnover, disability and retirement.

The valuation does not take into consideration:

- Changes in the law after the valuation date,
- Transfers between retirement systems pursuant to Section 3(8)(c) of Chapter 32,
- State-mandated benefits and
- Cost-of-living increases granted to members in pay status between 1982 and 1997.

GASB Statement Numbers 67 and 68

In June 2012, the GASB approved two related Statements that significantly changed the way pension plans and governments account and report pension liabilities. Effective for plans with fiscal years beginning after June 15, 2013, GASB Statement No. 67, Financial Reporting for Pension Plans, replaced the requirements of Statement No. 25 and effective for employers with fiscal years beginning after June 15, 2014, GASB Statement No. 68, Accounting and Financial Reporting for Pensions, replaced the requirements of Statement No. 27.

The new pension standards reflect changes from those previously in place regarding how governments calculate total pension liability and pension expense. Further, the new standards contain requirements for disclosing information in the notes to financial statements and presenting required supplementary information following the notes.

The required disclosures and notes under the new GASB Statements for the fiscal year ending December 31, 2015 are provided in a separate report.

SECTION 1 - SUMMARY

Actuarial Valuation

During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to increase from \$599,423,432 as of January 1, 2014 to \$608,025,239 as of January 1, 2016, for a total increase of \$8,601,807. The actual unfunded actuarial accrued liability, before any assumption or plan changes, was \$637,343,357, resulting in an actuarial loss of \$29,318,118. The actuarial loss was primarily due to an asset gain of \$4,027,781 and a demographic experience loss of \$33,345,899. The details of the gain and loss analysis are provided in Exhibit 2.6.

Appropriations

The funding appropriation for each year is computed as the sum of the normal cost, net 3(8)(c) transfers and an amortization payment to pay off the Unfunded Actuarial Liability, adjusted for semi-annual payments of the appropriation made July 1 and January 1. The appropriation calculated as of the January 1, 2016 valuation is \$73,876,969, and is made up of a normal cost payment of \$15,595,077, net 3(8)(c) transfers of \$2,837,161, and an amortization payment of \$55,444,731. The amortization method is an increasing amortization of the unfunded actuarial accrued liability at 4% over 19 years and is expected to fully pay the unfunded actuarial accrued liability by the year 2035. The development of the appropriation as of January 1, 2016 is presented in Exhibit 3.1.

For fiscal year 2017, we show the actual appropriation developed under the previous funding schedule and reported on the PERAC "Required Fiscal Year 2017 Appropriation" letter dated December 4, 2015 of \$46,814,607. For fiscal year 2018, we developed an annual appropriation of \$51,474,497, which is made up of a normal cost and net 3(8)(c) transfers of \$20,057,051 and payment toward the unfunded actuarial accrued liability (including payments for the Early Retirement Incentives) of \$31,417,446. The unfunded actuarial accrued liability is expected to be fully paid by 2035. The current funding schedule is shown in Exhibit 3.2.

SECTION 1 - SUMMARY

A summary of principal valuation results from the current valuation and the prior valuation follows. Changes in actuarial assumptions and methods and Plan provisions are discussed below, as well as changes in census data and asset information.

Valuation Date	<u>1/1/2016</u>	<u>1/1/2014</u>	<u>Increase/ (Decrease)</u>
Summary of Member Data			
Active Members	6,773	6,411	5.6%
Average Age	48.0	48.2	(0.4%)
Average Service	10.6	10.5	1.0%
Valuation Salary	\$282,918,805	\$252,829,591	11.9%
Average Salary	\$41,771	\$39,437	5.9%
Retired Members and Beneficiaries	3,122	2,840	9.9%
Average Age	73.8	74.1	(0.4%)
Total Annual Pension	\$59,160,612	\$49,183,380	20.3%
Average Annual Pension	\$18,950	\$17,318	9.4%
State Reimbursed COLAs	\$465,830	\$506,325	(8.0%)
Total System-Funded Pension	\$58,694,782	\$48,677,055	20.6%
Disabled Members	260	247	5.3%
Average Age	62.6	63.5	(1.4%)
Total Annual Pension	\$8,025,611	\$7,134,240	12.5%
Average Annual Pension	\$30,868	\$28,884	6.9%
State Reimbursed COLAs	\$74,425	\$106,602	(30.2%)
Total System-Funded Pension	\$7,951,186	\$7,027,638	13.1%
Inactive Members	1,925	1,711	12.5%
Annuity Savings Fund	\$15,987,062	\$12,940,975	23.5%
Funded Status - Market Value of Assets			
Actuarial Accrued Liability (AAL)	\$1,369,393,800	\$1,087,769,903	25.9%
Market Value of Assets (MVA)	\$573,959,894	\$512,236,584	12.0%
Unfunded Accrued Liability	\$795,433,906	\$575,533,319	38.2%
Funded Status	41.9%	47.1%	(11.0%)
Funded Status - Actuarial Value of Assets			
Actuarial Accrued Liability (AAL)	\$1,369,393,800	\$1,087,769,903	25.9%
Actuarial Value of Assets (AVA)	594,790,118	488,346,471	21.8%
Unfunded Accrued Liability	\$774,603,682	\$599,423,432	29.2%
Funded Status	43.4%	44.9%	(3.3%)

SECTION 1 - SUMMARY

Valuation Date	<u>1/1/2016</u>	<u>1/1/2014</u>	<u>Increase/ (Decrease)</u>
Normal Cost			
Employer	\$14,495,077	\$6,134,320	136.3%
Employee	26,597,269	23,492,514	13.2%
Administrative Expenses	1,100,000	1,000,000	10.0%
Total Normal Cost	\$42,192,346	\$30,626,834	37.8%
Appropriations			
Fiscal Year 2016	N/A	\$43,346,858	N/A
Fiscal Year 2017	\$46,814,607	\$46,814,607	0.0%
Fiscal Year 2018	\$51,474,497	\$50,559,776	1.8%
Fiscal Year 2019	\$56,598,226	\$54,604,558	3.7%

Actuarial Assumptions and Methods

Some Actuarial Assumptions and Methods used in this valuation have changed since the last valuation, including adopting new mortality tables and mortality improvement scales, increasing the salary increase assumption for all employees, increasing administrative expense assumption from \$1,000,000 to \$1,100,000, and decreasing the long-term rate of return from 8% to 7.75%. Changing these assumptions resulted in a net increase in the unfunded actuarial accrued liability of \$113,030,701 and an increase in the employer normal cost of \$8,426,257. The Actuarial Assumptions and Methods utilized in this valuation are detailed in Section 6, Actuarial Assumptions and Methods.

Plan Provisions

Effective January 1, 2015, the Athol Retirement System ceased to exist and all assets and liabilities were transferred to the Worcester Regional Retirement System. The increase in the Unfunded Actuarial Accrued Liability due to the inclusion of the liabilities and assets attributed to the members and retirees of the Athol Retirement System is \$24,229,624. All other Plan provisions used in this valuation are the same as those used in the prior valuation, and are summarized in Section 5, Summary of Plan Provisions.

Census Data

As of January 1, 2016, there are 6,773 active members who may be eligible for benefits in the future, 3,122 retirees and beneficiaries, 1,925 inactives and 260 disabled retirees. Summaries of the active, retired and disabled employees are included in Section 7, Demographic Information.

SECTION 1 - SUMMARY

Assets

This valuation is based upon asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Worcester Regional Retirement Board. The market value of assets increased from \$512,236,584 as of January 1, 2014 to \$573,959,894 as of January 1, 2016. During the plan years ended 2014 and 2015, the market value rates of return were 7.84% and 0.21%, respectively.

The market value of assets includes transfers made during 2015 to the Worcester Regional Retirement System from the Athol Retirement System of \$23,368,819.

The actuarial value of assets increased from \$488,346,471 as of January 1, 2014 to \$594,790,118 as of January 1, 2016. During the plan years ended 2014 and 2015, the rates of return on the actuarial value of assets were 9.64% and 7.13%, respectively.

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.1 - Plan Assets

Asset information is reported annually to the Public Employee Retirement Administration Commission by the Worcester Regional Retirement System. The Market Value of Assets for the two most recent calendar years are as follows:

Calendar Year	2015	2014
Trust Fund Composition at Year-End		
Cash	\$8,256,694	\$6,557,512
Short-Term Investments	0	0
Fixed Income Securities	0	0
Equities	0	0
Pooled Short Term Funds	0	0
Pooled Domestic Equity Funds	0	0
Pooled International Equity Funds	0	0
Pooled Global Equity Funds	0	0
Pooled Domestic Fixed Income Funds	0	0
Pooled International Fixed Income Funds	0	0
Pooled Global Fixed Income Funds	0	0
Pooled Alternative Investments	5,537,390	9,790,870
Pooled Real Estate Funds	6,002,240	15,446,297
Pooled Domestic Balanced Funds	0	0
Pooled International Balanced Funds	0	0
Hedge Funds	0	0
PRIT Cash	0	0
PRIT Fund	554,348,825	519,729,613
Interest Due & Accrued	0	0
Prepaid Expenses	0	0
Accounts Receivable	5,542,676	3,186,069
Land	0	0
Buildings	0	0
Accumulated Depreciation - Buildings	0	0
Accounts Payable	(5,727,931)	(2,207,889)
Total Market Value of Assets ¹	<u>\$573,959,894</u>	<u>\$552,502,472</u>

¹ The market value of assets as of December 31, 2015 of \$573,959,894 differs from the market value of assets disclosed in the 2015 Plan financial statements of \$569,632,634. The difference represents a Generally Accepted Accounting Principles (GAAP) financial statement accrual of \$4,327,260 for amounts due to the Commonwealth.

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.1 - Plan Assets

Calendar Year	2015	2014
Funds		
Annuity Savings Fund	\$256,353,295	\$239,280,974
Annuity Reserve Fund	63,023,021	56,746,489
Special Military Service Fund	146,258	119,508
Pension Fund	264,915	3,027,464
Expense Fund	0	0
Pension Reserve Fund	254,172,405	253,328,037
Total Market Value of Assets	<u>\$573,959,894</u>	<u>\$552,502,472</u>
Asset Activity		
Market value as of Beginning of Year	\$552,502,472	\$512,236,584
Contributions and Receipts (including Athol transfers)	99,522,714	72,605,213
Benefit Payments and Expenses	(79,247,968)	(72,488,488)
Investment Return	1,182,676	40,149,163
Market Value as of End of Year	<u>\$573,959,894</u>	<u>\$552,502,472</u>
Computed Rate of Return	0.21%	7.84%

Returns and annualized past returns developed by PERAC are shown below. Information is obtained from the Annual Investment Reports published by PERAC for the years shown.

Year	1-Year Return	5-Year Return	10-Year Return*	Return (Since 1985)
2015	0.92%	7.37%	5.03%	8.09%
2014	8.63%	9.67%	5.49%	8.34%
2013	14.86%	10.57%	5.59%	8.33%
2012	13.54%	1.08%	5.73%	8.10%
2011	-0.18%	0.21%	3.42%	7.91%
2010	12.20%	2.74%	2.94%	8.23%
2009	13.15%	1.47%	1.53%	8.08%
2008	-26.65%	0.83%		7.87%
2007	8.72%	10.58%		9.69%
2006	13.05%	6.74%		9.74%
2005	5.44%	3.15%		9.58%
2004	9.63%	1.59%		9.79%

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.1 - Plan Assets

Valuation Date	1/1/2016	1/1/2015	1/1/2014
1. Market Value of Assets as of prior January 1	\$552,502,472	\$512,236,584	\$446,959,556
a. Prior Year Contributions and Receipts	99,522,714	72,605,213	64,748,906
b. Prior Year Benefit Payments and Expenses	(79,247,968)	(72,488,488)	(62,687,913)
c. Expected Investment Return Rate	8.00%	8.00%	8.00%
d. Expected Investment Return	45,078,770	40,983,985	35,846,074
e. Expected Market Value of Assets as of Valuation Date	\$617,855,988	\$553,337,294	\$484,866,623
2. Prior Year Gain / (Loss)			
a. Market Value of Assets as of January 1	\$573,959,894	\$552,502,472	\$512,236,584
b. Expected Market Value of Assets	617,855,988	553,337,294	484,866,623
c. Prior Year Gain / (Loss)	(43,896,094)	(834,822)	27,369,961
3. Phase-In of Asset Gains and Losses			
Plan Year	Gain / (Loss)	Unrecognized Gain / (Loss)	Unrecognized Gain / (Loss)
a. 2015	(\$43,896,094)	(\$35,116,875)	-
b. 2014	(834,822)	(500,893)	(667,858)
c. 2013	27,369,961	10,947,984	16,421,977
d. 2012	19,197,802	3,839,560	7,679,121
e. 2011	(32,373,484)	-	(6,474,697)
f. 2010	17,124,285	-	-
g. Total deferred gains/(losses)		(20,830,224)	16,958,543
			23,890,113
4. Actuarial Value of Assets			
a. Market Value of Assets Less Unrecognized Gain / (Loss)	\$594,790,118	\$535,543,929	\$488,346,471
b. 80% of Market Value of Assets	459,167,915	442,001,978	409,789,267
c. 120% of Market Value of Assets	688,751,873	663,002,966	614,683,901
d. Actuarial Value of Assets, a., but not less than b. and not greater than c.	\$594,790,118	\$535,543,929	\$488,346,471
e. Ratio of Actuarial Value of Assets to Market Value of Assets	103.63%	96.93%	95.34%
5. Rate of Return on Actuarial Value of Assets for Prior Calendar Year	7.13%	9.64%	10.19%

SECTION 2 - PRINCIPAL VALUATION RESULTS

The **Actuarial Present Value of Future Benefits** is the present value of the cost to finance all benefits payable in the future, discounted to reflect the probability of payment and the time value of money. Below is the Actuarial Present Value of Future Benefits from the current valuation and the prior valuation:

Exhibit 2.2 - Actuarial Present Value of Future Benefits

Valuation Date	<u>1/1/2016</u>	<u>1/1/2014</u>
Actives		
Superannuation	\$877,942,097	\$631,264,533
Termination	33,166,922	29,892,835
Death	41,741,660	38,513,768
Disability	86,701,568	64,522,223
Total Actives	<u>\$1,039,552,247</u>	<u>\$764,193,359</u>
Retired Members and Inactives		
Retired Members and Beneficiaries	\$570,882,886	\$454,254,767
Disabled Members	94,136,290	79,922,522
Inactive Members	16,263,360	12,940,975
Total Retired Members and Inactives	<u>\$681,282,536</u>	<u>\$547,118,264</u>
Total Present Value of Future Benefits	\$1,720,834,783	\$1,311,311,623

The **Actuarial Accrued Liability** is the portion of the Actuarial Present Value of Future Benefits which is allocated to all periods prior to a valuation year and therefore is not provided for by future Normal Costs. Below is the Actuarial Accrued Liability from the current valuation and the prior valuation:

Exhibit 2.3 - Actuarial Accrued Liability

Valuation Date	<u>1/1/2016</u>	<u>1/1/2014</u>
Actives		
Superannuation	622,769,864	\$479,808,388
Termination	18,780,617	14,469,386
Death	17,244,956	20,684,472
Disability	29,315,827	25,689,393
Total Actives	<u>\$688,111,264</u>	<u>\$540,651,639</u>
Retired Members and Inactives		
Retired Members and Beneficiaries	\$570,882,886	\$454,254,767
Disabled Members	94,136,290	79,922,522
Inactive Members	16,263,360	12,940,975
Total Retired Members and Inactives	<u>\$681,282,536</u>	<u>\$547,118,264</u>
Total Actuarial Accrued Liability	\$1,369,393,800	\$1,087,769,903

SECTION 2 - PRINCIPAL VALUATION RESULTS

The **Normal Cost** is the portion of the Actuarial Present Value of Future Benefits which is allocated to a valuation year. Only active employees who have not reached Normal Retirement Age incur a Normal Cost. Below is the Normal Cost from the current valuation and the prior valuation:

Exhibit 2.4 - Normal Cost

Valuation Date	<u>1/1/2016</u>	<u>1/1/2014</u>
Actives		
Superannuation	\$26,738,160	\$17,422,094
Termination	5,461,010	5,159,592
Death	3,007,985	2,477,164
Disability	5,885,191	4,567,984
Total Actives	<u>\$41,092,346</u>	<u>\$29,626,834</u>
As of Percentage of Salary	14.5%	11.7%
Administrative Expenses	\$1,100,000	\$1,000,000
As of Percentage of Salary	0.4%	0.4%
Total Normal Cost		
Normal Cost	\$42,192,346	\$30,626,834
As a Percentage of Salary	14.9%	12.1%
Employee Normal Cost		
Employee Contributions	\$26,597,269	\$23,492,514
As a Percentage of Salary	9.4%	9.3%
Employer Normal Cost		
Employer Normal Cost	\$15,595,077	\$7,134,320
As a Percentage of Salary	5.5%	2.8%

Exhibit 2.5 - Unfunded Actuarial Accrued Liability

Valuation Date	<u>1/1/2016</u>	<u>1/1/2014</u>
Unfunded Actuarial Accrued Liability		
a. Actuarial Accrued Liability	\$1,369,393,800	\$1,087,769,903
b. Actuarial Value of Assets	594,790,118	488,346,471
c. Unfunded Actuarial Accrued Liability (a. - b.)	\$774,603,682	\$599,423,432
d. Funded Ratio (b. divided by a.)	43.4%	44.9%

SECTION 2 - PRINCIPAL VALUATION RESULTS

Exhibit 2.6 - Actuarial Experience

In performing the actuarial valuation, various assumptions are made regarding mortality, retirement, disability and withdrawal rates as well as salary increases and investment returns. A comparison of the results of the current valuation and the prior valuation is made to determine how closely actual experience relates to expected. During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to increase by \$8,601,807. Below is the development of the Actuarial Gain or Loss for the current 2-year period:

Calendar Year Ending	<u>12/31/2015</u>	<u>12/31/2014</u>
Expected Unfunded Actuarial Accrued Liability		
a. Unfunded Actuarial Accrued Liability, beginning of year	\$604,702,848	\$599,423,432
b. Normal cost, beginning of year	\$31,851,907	30,626,834
c. Total contributions	76,153,895	72,605,213
d. Interest (full year on a. and b., one-half year on c.)	47,624,378	47,257,795
e. Expected Unfunded Actuarial Accrued Liability	\$608,025,239	\$604,702,848
f. Unfunded Actuarial Accrued Liability (before changes)	\$637,343,357	
g. (Gain)/Loss	\$29,318,118	
Asset (gain)/loss		
a. Actuarial value of assets, beginning of year	\$535,543,929	\$488,346,471
b. Contributions and Receipts	76,153,895	72,605,213
c. Benefit Payments and Expenses	(79,247,968)	(72,488,488)
d. Assumed rate of return (prior valuation)	8.00%	8.00%
e. Expected return	42,709,438	39,072,776
f. Actuarial value of assets, end of year	570,538,481	535,543,929
g. Actual return	38,088,625	47,080,733
h. Actual rate of return	7.13%	9.64%
i. Asset (gain)/loss	\$4,620,813	(\$8,007,957)
j. Total asset (gain)/loss, 2-year period	(\$4,027,781)	
Actual Unfunded Actuarial Accrued Liability		
a. Changes due to:		
i) Asset (gain)/loss	(\$4,027,781)	
ii) (Gain)/loss from demographic experience	33,345,899	
iii) (Gain)/loss prior to changes	29,318,118	
iv) Plan change - Athol Retirement System	24,229,624	
v) Assumption change - Mortality Rates	35,735,265	
vi) Assumption change - Salary Scale	40,432,583	
vii) Assumption change - Investment Return	36,862,853	
viii) Total changes	166,578,443	
b. Unfunded Actuarial Accrued Liability, end of year	\$774,603,682	

Worcester Regional Retirement System
Actuarial Valuation as of January 1, 2016

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibit 3.1 - Annual Appropriations

The **Annual Appropriation** is determined in accordance with the requirements set forth in Section 22D of Chapter 32 of the Massachusetts General Laws ("M.G.L."). The appropriation is comprised of the annual employer normal cost and amortization payments to pay the unfunded actuarial accrued liability. Below are the details of the annual appropriations for the current and prior valuations, adjusted for semi-annual payments made each July 1 and January 1. The appropriations shown are based on the results of the valuations and do not account for any adjustments made to appropriations in the selected funding schedule.

Amortization Payments	<u>1/1/2016</u>	<u>1/1/2014</u>
a. Early Retirement Incentive Plan (2002)		
Fully Funded Year	2028	2028
Balance as of valuation date	\$12,571,626	\$13,026,157
Amortization Amount	\$1,232,938	\$1,142,520
Remaining Payment Period (from Valuation date)	12	14
b. Early Retirement Incentive Plan (2003)		
Fully Funded Year	2028	2028
Balance as of valuation date	\$2,464,816	\$2,553,933
Amortization Amount	\$241,732	\$224,005
Remaining Payment Period (from Valuation date)	12	14
c. Early Retirement Incentive Plan (2010)		
Fully Funded Year	2022	2022
Balance as of valuation date	\$27,386	\$34,043
Amortization Amount	\$5,456	\$5,485
Remaining Payment Period (from Valuation date)	6	8
d. Unfunded Actuarial Accrued Liability		
Fully Funded Year	2035	2035
Balance as of valuation date	\$759,539,854	\$583,809,299
Amortization Amount	\$53,964,605	\$39,507,010
Remaining Payment Period (from Valuation date)	19	21
e. Total Amortization Payments	\$55,444,731	\$40,879,020
Normal Cost	\$15,595,077	\$7,134,320
Net 3(8)(c) Transfers	\$2,837,161	\$1,660,000
Total Appropriation as of January 1	\$73,876,969	\$49,673,340
Adjusted for Payments as of July 1 and January 1	\$78,117,154	\$52,615,148

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibits 3.2 and 3.3 are based on the assumptions below:

Exhibit 3.2:

- Total Normal Cost is expected to increase 4% per year.
- The Employee Contribution rate will increase linearly from the 2016 percentage to 10.50% by 2028 as members contributing at the lower rates are replaced by new members contributing over 9%.
- Employer Normal Cost is the difference between Total Normal Cost and Employee Contributions.
- The Unfunded Actuarial Accrued Liability ("UAL") is computed as of January 1 of each year assuming no future gains or losses.
- The Amortization Payment of UAL is an increasing payment at 4% paid over 19 years through 2035.
- The Amortization Payment of the Early Retirement Incentive Plan (2002) is an increasing payment at 4.5% paid over 12 years through 2028.
- The Amortization Payment of the Early Retirement Incentive Plan (2003) is an increasing payment at 4.5% paid over 12 years through 2028.
- The Amortization Payment of the Early Retirement Incentive Plan (2010) is a level payment to be paid over 6 years through 2022.
- Total Employer Cost is the sum of the Employer Normal Cost, net 3(8)(c) transfers and the Amortization of the UAL (including ERIs), all computed as of January 1 of each year and adjusted for semi-annual payments made on July 1 and January 1.
- For fiscal year 2017, we show the actual appropriation developed under the previous funding schedule of \$46,814,607. For fiscal years 2018 and later, the Board has selected a funding schedule that fully amortizes the unfunded actuarial accrued liability by 2035, with annual employer costs limited to increases of 9.95% over the prior year.

Exhibit 3.3:

- Expected benefit payments include payments expected to be made to retired members, beneficiaries, disabled members and active members expected to retire. In addition, expected benefit payments include distribution of the annuity savings fund attributed to inactive members.
- Benefit payments exclude cost-of-living increases granted to members in pay status between 1982 and 1997. In addition, benefit payments are as expected for the first ten years of the forecast, then increase by the greater of 4.50% per year thereafter or the expected future payments for the current population projected by our computer model.
- Calendar year cash flow entries are developed as of each January 1.

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibit 3.2 - 30-Year Forecast of Annual Appropriations

Fiscal Year Endin g	Employer Normal Cost	Amortization Payment of UAL	Amortization Payment of ERI 2002	Amortization Payment of ERI 2003	Amortization Payment of ERI 2010	Total Employer Cost	Increase over Prior Year	Unfunded Actuarial Accrued Liability
2017	\$19,490,160	\$25,759,369	\$1,303,703	\$255,606	\$5,769	\$46,814,607		\$774,603,682
2018	20,057,051	29,782,198	1,362,369	267,110	5,769	51,474,497	9.95%	806,791,487
2019	20,642,910	34,246,743	1,423,676	279,128	5,769	56,598,226	9.95%	837,303,027
2020	21,248,345	39,198,423	1,487,741	291,689	5,769	62,231,967	9.95%	865,555,059
2021	21,873,986	44,687,226	1,554,689	304,815	5,769	68,426,485	9.95%	890,872,713
2022	22,520,485	50,768,170	1,624,651	318,532	5,769	75,237,607	9.95%	912,477,722
2023	23,188,500	57,507,570	1,697,760	332,866	-	82,726,696	9.95%	929,475,286
2024	23,878,726	64,960,515	1,774,157	347,845	-	90,961,243	9.95%	940,839,396
2025	24,591,869	73,206,092	1,853,997	363,499	-	100,015,457	9.95%	945,396,458
2026	25,328,658	82,324,975	1,937,425	379,855	-	109,970,913	9.95%	941,807,031
2027	26,089,842	92,405,930	2,024,611	396,949	-	120,917,332	9.95%	928,545,476
2028	26,876,194	103,546,622	2,115,718	414,812	-	132,953,346	9.95%	903,877,260
2029	27,688,510	118,498,905	-	-	-	146,187,415	9.95%	865,833,700
2030	28,676,051	132,062,743	-	-	-	160,738,794	9.95%	812,183,829
2031	29,703,092	147,035,512	-	-	-	176,738,604	9.95%	740,554,360
2032	30,771,216	163,559,807	-	-	-	194,331,023	9.95%	648,116,153
2033	31,882,064	181,792,514	-	-	-	213,674,578	9.95%	531,675,506
2034	33,037,347	201,906,228	-	-	-	234,943,575	9.95%	387,631,334
2035	34,238,842	224,091,226	-	-	-	258,330,068	9.95%	211,927,593
2036	35,488,394	-	-	-	-	35,488,394	-86.26%	-
2037	36,787,930	-	-	-	-	36,787,930	3.66%	-
2038	38,139,448	-	-	-	-	38,139,448	3.67%	-
2039	39,545,026	-	-	-	-	39,545,026	3.69%	-
2040	41,006,826	-	-	-	-	41,006,826	3.70%	-
2041	42,527,099	-	-	-	-	42,527,099	3.71%	-
2042	44,108,183	-	-	-	-	44,108,183	3.72%	-
2043	45,752,511	-	-	-	-	45,752,511	3.73%	-
2044	47,462,611	-	-	-	-	47,462,611	3.74%	-
2045	49,241,115	-	-	-	-	49,241,115	3.75%	-
2046	51,090,759	-	-	-	-	51,090,759	3.76%	-

Worcester Regional Retirement System
Actuarial Valuation as of January 1, 2016

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibit 3.3 - 30-Year Forecast of Cash Flow

Calendar Year	Assets, BOY	Benefit Payments	Employee Contributions	Employer Contributions	Investment Return	Assets, EOY
2016	\$573,959,894	\$89,539,733	\$26,597,269	\$44,273,519	\$46,215,574	\$601,506,523
2017	601,506,523	77,833,706	27,748,842	48,680,470	49,272,633	649,374,761
2018	649,374,761	82,874,824	28,949,986	53,526,085	53,239,423	702,215,431
2019	702,215,431	88,138,452	30,202,823	58,854,028	57,623,623	760,757,452
2020	760,757,452	93,786,104	31,509,567	64,712,311	62,478,836	825,672,062
2021	825,672,062	99,699,293	32,872,526	71,153,722	67,866,326	897,865,342
2022	897,865,342	105,749,135	34,294,106	78,236,307	73,866,410	978,513,030
2023	978,513,030	111,883,293	35,776,817	86,023,886	80,577,547	1,069,007,986
2024	1,069,007,986	118,001,828	37,323,274	94,586,635	88,117,518	1,171,033,585
2025	1,171,033,585	124,240,330	38,936,204	104,001,712	96,617,286	1,286,348,456
2026	1,286,348,456	130,709,783	40,618,452	114,353,960	106,215,279	1,416,826,364
2027	1,416,826,364	137,461,042	42,372,982	125,736,661	117,062,041	1,564,537,005
2028	1,564,537,005	144,370,268	44,202,885	138,252,388	129,331,358	1,731,953,368
2029	1,731,953,368	150,906,429	45,971,000	152,013,920	143,235,291	1,922,267,149
2030	1,922,267,149	157,697,218	47,809,840	167,145,264	159,014,727	2,138,539,762
2031	2,138,539,762	164,793,593	49,722,234	183,782,769	176,915,572	2,384,166,743
2032	2,384,166,743	172,209,305	51,711,123	202,076,360	197,212,249	2,662,957,170
2033	2,662,957,170	179,958,724	53,779,568	222,190,879	220,212,373	2,979,181,266
2034	2,979,181,266	188,056,867	55,930,750	244,307,957	246,260,577	3,337,623,682
2035	3,337,623,682	196,519,426	58,167,981	33,562,091	257,525,194	3,490,359,522
2036	3,490,359,522	205,362,800	60,494,700	34,791,088	269,266,552	3,649,549,061
2037	3,649,549,061	214,604,126	62,914,488	36,069,245	281,502,389	3,815,431,057
2038	3,815,431,057	224,261,312	65,431,067	37,398,529	294,250,898	3,988,250,238
2039	3,988,250,238	234,353,071	68,048,310	38,780,983	307,530,717	4,168,257,177
2040	4,168,257,177	244,898,959	70,770,242	40,218,736	321,360,923	4,355,708,118
2041	4,355,708,118	255,919,412	73,601,052	41,713,999	335,761,012	4,550,864,769
2042	4,550,864,769	267,435,786	76,545,094	43,269,073	350,750,886	4,753,994,035
2043	4,753,994,035	279,470,396	79,606,898	44,886,349	366,350,830	4,965,367,716
2044	4,965,367,716	292,046,564	82,791,174	46,568,316	382,581,487	5,185,262,128
2045	5,185,262,128	305,188,659	86,102,821	48,317,562	399,463,829	5,413,957,681

SECTION 4 - REQUIRED DISCLOSURES

Exhibit 4.1 - GASB 67 and GASB 68 Disclosures

In June 2012, the GASB approved two related Statements that significantly changed the way pension plans and governments account and report pension liabilities. Effective for plans with fiscal years beginning after June 15, 2013, GASB Statement No. 67, *Financial Reporting for Pension Plans*, replaced the requirements of Statement No. 25 and effective for employers with fiscal years beginning after June 15, 2014, GASB Statement No. 68, *Accounting and Financial Reporting for Pensions*, replaced the requirements of Statement No. 27.

The new pension standards reflect changes from those currently in place regarding how governments calculate total pension liability and pension expense. Further, the new standards contain requirements for disclosing information in the notes to financial statements and presenting required supplementary information following the notes.

GASB 67 requires defined benefit pension plans, such as the Worcester Regional Retirement System, to present a statement of fiduciary net position (pension plan assets) and a statement of changes in fiduciary net position. Further, the statement requires that notes to financial statements include descriptive information such as the types of benefits provided, the classes of plan members covered and the composition of the pension plan's retirement board. Finally, GASB 67 requires pension plans to present in required supplementary information the sources of the changes in the net pension liability and information about the actuarially determined contributions compared with the actual contributions made to the plan and related ratios.

GASB 67 and GASB 68 require projected benefit payments be discounted to their actuarial present value using the single rate that reflects:

- (1) a long-term expected rate of return on pension plan investments *to the extent that the pension plan's assets are sufficient to pay benefits and pension plan assets are expected to be invested using a strategy to achieve that return and*
- (2) a tax-exempt, high-quality municipal bond rate *to the extent that the conditions for use of the long-term expected rate of return are not met.*

GASB 68 establishes standards for measuring and recognizing liabilities, deferred outflows of resources, deferred inflows of resources and pension expense by state and local governments.

The effective date for GASB 67 is for plan years beginning after June 15, 2013, which is fiscal year ending December 31, 2014 for the Worcester Regional Retirement System. The effective date for GASB 68 is for employers' fiscal years beginning after June 15, 2014. The GASB report, submitted under separate cover and prepared as of December 31, 2015 (the measurement date), presents information to assist the Worcester Regional Retirement System in providing the required information under GASB 68 to participating employers.

SECTION 4 - REQUIRED DISCLOSURES

Exhibit 4.2 - PERAC Disclosures

The most recent actuarial valuation of the System was prepared by KMS Actuaries, LLC as of January 1, 2016.

The normal cost for employees on that date was:	\$26,597,269	9.4% of payroll
The normal cost for the employer was:	\$15,595,077	5.5% of payroll

The actuarial liability for active members was:	\$688,111,264
The actuarial liability for retired and inactive members was:	681,282,536
Total actuarial liability:	\$1,369,393,800
System assets as of that date:	\$594,790,118
Unfunded actuarial accrued liability:	\$774,603,682

The ratio of System assets to total actuarial accrued liability was:	43.4%
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The principal actuarial assumptions used in the valuation are as follows:

Investment Return:	7.75%
Rate of Salary Increase:	Based on service, 6% graded down to 4.25% for Group 1
	Based on service, 7% graded down to 4.75% for Group 4

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Administration There are 104 contributory retirement systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by Chapter 32 of the Massachusetts General Laws and other applicable statutes. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.

Participation Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the local retirement board, and approved by PERAC. Membership is optional for certain elected officials.

There are four classes of membership in the Retirement System:

Group 1:	General employees, including clerical, administrative, technical and all other employees not otherwise classified.
Group 2:	Certain specified hazardous duty positions.
Group 3:	State police officers and inspectors.
Group 4:	Local police officers, firefighters and other specified hazardous positions.

For members in more than one group, participation will be proportional.

Member Contributions Member contributions vary depending on the most recent date of membership:

Prior to 1975:	5% of Salary
1975 – 1983:	7% of Salary
1984 – June 30, 1996:	8% of Salary
July 1, 1996 – present:	9% of Salary
1979 – present:	An additional 2% of Salary in excess of \$30,000.
Group 1 members hired on or after April 2, 2012:	6% of Salary with 30 or more years of creditable service.

Rate of Interest Interest on regular deductions made after January 1, 1984 is a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average rates paid on individual savings accounts by a representative sample of at least ten financial institutions.

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Retirement Age	The mandatory retirement age for some Group 2 and Group 4 members is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for members in Group 1.
Salary	Gross regular compensation. This does not include bonuses, overtime, severance pay, unused sick leave credit or other similar compensation.
Average Salary	<p>Membership before April 2, 2012: Average annual rate of regular compensation received during the three consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.</p> <p>Membership on or after April 2, 2012: Average annual rate of regular compensation received during the five consecutive years that produce the highest average, or, if greater, during the last five years (whether or not consecutive) preceding retirement.</p>
Creditable Service	The period during which a member contributes to the retirement system plus certain periods of military service and "purchased" service.
Benefit Rate	The benefit rate varies with the member's retirement age, Group, membership date and years of creditable service at retirement. Each year a member retires prior to the age at which the 2.5% maximum benefit rate applies, a reduction is applied to each year of age under the maximum age. The maximum age and reduction for each Group and membership date is as follows:

	<u>Group 1</u>	<u>Group 2</u>	<u>Group 4</u>
2.5% for Membership before April 2, 2012:			
Maximum age:	65	60	55
Reduction:	0.1%	0.1%	0.1%
2.5% for Membership on or after April 2, 2012 (less than 30 years of service):			
Maximum age:	67	62	57
Reduction:	0.15%	0.15%	0.15%
2.5% for Membership on or after April 2, 2012 (30+ years of service):			
Maximum age:	67	62	57
Reduction:	0.125%	0.125%	0.125%

Worcester Regional Retirement System
Actuarial Valuation as of January 1, 2016

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Superannuation Retirement	Eligibility if membership before April 2, 2012:	<ul style="list-style-type: none"> • completion of 20 years of Creditable Service, or • attainment of age 55 if hired prior to 1978, or • attainment of age 55 with 10 years of Creditable Service, if hired after 1978.
	Eligibility if membership on or after April 2, 2012:	<ul style="list-style-type: none"> • attainment of age 60 with 10 years of Creditable Service if classified in Group 1 • attainment of age 55 with 10 years of Creditable Service if classified in Group 2 • attainment of age 55 if hired prior to 1978 or if classified in Group 4
	Benefit Amount	Product of the member's Benefit Rate, Average Salary and Creditable Service.
	Maximum Benefit	80% of the member's Average Salary.
	Veteran's Benefit	Additional benefit of \$15 per year of Creditable Service, up to a maximum of \$300.
Deferred Vested	Eligibility	<ul style="list-style-type: none"> • completion of ten or more years of Creditable Service. • elected officials hired prior to 1978, completion of six years of Creditable Service.
	Benefit Amount	Accrued benefit payable commencing at age 55, or the completion of 20 years of Creditable Service, or may be deferred until later at the participant's option.
Withdrawal of Contributions		Contributions may be withdrawn upon termination of employment.
		<ul style="list-style-type: none"> • Members hired on or after January 1, 1984 who terminate with less than ten years of Creditable Service receive contributions plus interest on the Annuity Savings Account at an annual rate of 3%. • All other withdrawals receive contributions plus 100% of the regular interest that has accrued to the Annuity Savings Account.

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Ordinary Disability Retirement	Eligibility	Non-job related disability after completion of ten years of Creditable Service.
	Benefit Amount for Group 1 membership before April 2, 2012 or Group 2 or Group 4	Superannuation benefit determined if the member is age 55, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
	Benefit Amount for Group 1 membership on or after April 2, 2012	Superannuation benefit determined if the member is age 60, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
Accidental Disability Retirement	Eligibility	Disabled as a result of an accident in the performance of duties. There is no minimum age or service requirement.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of \$15 per year of Creditable Service, up to a maximum of \$300.
	Supplemental Dependent Allowance	Additional allowance of \$415 per year for each child.
Non-Occupational Death	Eligibility	For members with at least two years of creditable service who die while in active service, but not due to occupational injury.
	Benefit Amount	Benefit as if Option C had been elected. Minimum benefit of \$250 per month for surviving spouse, \$120 per month for first child and \$90 per month for each additional child.

SECTION 5 - SUMMARY OF PLAN PROVISIONS

Accidental Death	Eligibility	For members who die as a result of an occupational injury.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of \$15 per year of creditable service, up to a maximum of \$300.
	Supplemental Dependent Allowance	Additional allowance of \$708.60 per year for each child until age 18 (or age 22 if a full-time student).
Cost-of-Living Adjustment (COLA)	In accordance with the adoption of Chapter 17 of the Acts of 1997, the granting of a Cost-of-Living Adjustment will be determined by an annual vote by the Retirement Board. The amount of increase will be based upon the Consumer Price Index, limited to a maximum of 3.0%, beginning on July 1. All retirees, disabled retirees and beneficiaries who have been receiving benefit payments for at least one year as of July 1 are eligible for the adjustment. The maximum amount of pension benefit subject to a COLA is \$16,000, effective July 1, 2015. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the Commonwealth of Massachusetts and are not the liability of the Retirement System.	
Optional Forms of Payment	A member may elect to receive his or her retirement allowance, payable in monthly installments, in one of three forms of payment:	
	<ul style="list-style-type: none">• Option A – Total annual allowance commencing at retirement and terminating at member's death.	
	<ul style="list-style-type: none">• Option B – A reduced annual allowance commencing at retirement with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefit paid to member.	
	<ul style="list-style-type: none">• Option C – A reduced annual allowance commencing at retirement with 66⅔% of benefit continued to designated beneficiary upon death of member. For members who retired on or after January 12, 1988, if the beneficiary pre-deceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement. For members who retired prior to January 12, 1988, if the System has accepted Section 288 of Chapter 194 of the Acts of 1998 and the beneficiary pre-deceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement.	

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Valuation Date	January 1, 2016
Investment Return	<p>7.75% per year. Previously, 8.00% per year.</p> <p>The investment return assumption is a long-term assumption based on capital market expectations by asset class, historical returns and professional judgment. We considered analysis prepared by PRIM's investment advisor using a building block approach and using the target asset allocation, expected returns by asset class and risk analysis to determine a long-term expected average annual rate of return.</p>
Annuity Savings Fund Interest Rate	2.00% per year
Amortization Method	<p><i>Unfunded Actuarial Accrued Liability (UAL):</i></p> <p>Increasing dollar amount at 4% to reduce the Unfunded Actuarial Accrued Liability to zero on or before June 30, 2035.</p> <p><i>Early Retirement Incentive Programs (ERI) for 2002 and 2003:</i></p> <p>Increasing dollar amount at 4.5% to reduce the Unfunded Actuarial Accrued Liability attributable to ERI to zero on or before June 30, 2028.</p> <p><i>Early Retirement Incentive Program (ERI) for 2010:</i></p> <p>Level dollar amount to reduce the Unfunded Actuarial Accrued Liability attributable to ERI to zero on or before June 30, 2022.</p>
Salary Scale	<p>The assumed annual rates for salary increases including longevity are illustrated by the following rates:</p>

<u>Years of Service</u>	<u>Groups 1 and 2</u>	<u>Group 4</u>
0	6.00%	7.00%
1	5.50%	6.50%
2	5.50%	6.00%
3	5.25%	5.75%
4	5.25%	5.25%
5	4.75%	5.25%
6	4.75%	4.75%
7	4.50%	4.75%
8	4.50%	4.75%
9+	4.25%	4.75%

Previously, 3% for all years.

The salary scale assumption is a long-term estimate derived from historical data, current and recent market expectations and professional judgment.

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Cost-of-Living Allowance Cost-of-Living Allowances (COLA) are assumed to be 3% of the pension amount, capped at \$480 per year.

Mortality Rates RP-2000 Mortality Table (base year 2009) with full generational mortality improvement using Scale BB. For disabled members, RP-2000 Mortality Table (base year 2012) with full generational mortality improvement using Scale BB. Previously, RP-2000 Mortality Table Projected to 2014 with Scale AA and RP-2000 Mortality Table set forward two years for disabled members.

General Employees: 55% of deaths are job-related.

Police and Fire: 90% of deaths are job-related.

The underlying tables with generational mortality improvement reasonably reflect the mortality experience of the System as of the valuation date based on historical and current demographic data. Further, PERAC reviewed a sampling of a few larger local retirement systems and compared the results with the results found in performing the analysis of the State Retirement System for years 2012 - 2014. For the State Retirement System analysis, the mortality assumptions reflect the recent experience study published in 2014.

Turnover Rates Illustrative turnover rates are shown below:

<u>Creditable Service</u>	<u>Groups 1 and 2</u>	<u>Group 4</u>
0	0.1500	0.0150
10	0.0540	0.0150
20	0.0200	0.0000
30	0.0000	0.0000

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Disability Rates

Illustrative disability rates are shown below:

<u>Attained Age</u>	<u>Groups 1 and 2</u>	<u>Group 4</u>
20	0.0001	0.0010
30	0.0003	0.0030
40	0.0010	0.0030
50	0.0019	0.0125

General Employees: 55% of disabilities are accidental and 45% are ordinary.

Police and Fire: 90% of disabilities are accidental and 10% are ordinary.

Retirement Rates

Illustrative retirement rates are shown below:

<u>Age</u>	<u>Groups 1 and 2</u>		<u>Group 4</u>
	<u>Male</u>	<u>Female</u>	<u>Male & Female</u>
50	0.0100	0.0150	0.0200
51	0.0100	0.0150	0.0200
52	0.0100	0.0200	0.0200
53	0.0100	0.0250	0.0500
54	0.0200	0.0250	0.0750
55	0.0200	0.0550	0.1500
56	0.0250	0.0650	0.1000
57	0.0250	0.0650	0.1000
58	0.0500	0.0650	0.1000
59	0.0650	0.0650	0.1500
60	0.1200	0.0500	0.2000
61	0.2000	0.1300	0.2000
62	0.3000	0.1500	0.2500
63	0.2500	0.1250	0.2500
64	0.2200	0.1800	0.3000
65	0.4000	0.1500	1.0000
66	0.2500	0.2000	1.0000
67	0.2500	0.2000	1.0000
68	0.3000	0.2500	1.0000
69	0.3000	0.2000	1.0000
70	1.0000	1.0000	1.0000

The turnover, disability and retirement rates are based on PERAC's most recent experience analysis of local retirement systems which reviewed age, gender and job group. The assumptions reflect this analysis as well as professional judgment.

SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

Actuarial Cost Method	Individual Entry Age Normal.
Actuarial Asset Method	<p>The Actuarial Value of Assets is the market value of assets as of the valuation date reduced by the sum of:</p> <ul style="list-style-type: none">a) 80% of gains and losses of the prior year,b) 60% of gains and losses of the second prior year,c) 40% of gains and losses of the third prior year andd) 20% of gains and losses of the fourth prior year. <p>Investment gains and losses are determined by the excess or deficiency of the expected return over the actual return on the market value. The actuarial valuation of assets is further constrained to be not less than 80% or more than 120% of market value.</p>
Census Data	Census data as of the valuation date were submitted by the Retirement Board.
Asset Data	Asset information is reported annually to the Public Employee Retirement Administration Commission by the Worcester Regional Retirement System.
Dependents	80% of all members will be survived by a spouse. Age assumption for spouses is that males are assumed to be three years older than females.
Net Section 3(8)(c) Transfers	Reimbursements paid to and received from other retirement systems for that portion of a retiree's pension that is based on service earned in another retirement system. Net 3(8)(c) transfers are assumed to be \$3,000,000 per year. Previously, \$1,660,000 per year.
Administrative Expenses	<p>The anticipated administrative expenses for the fiscal year. For Fiscal Year 2017, the administrative expenses were assumed to be \$1,100,000 and is anticipated to increase 4% per year. Previously, \$1,000,000, increasing 4% per year.</p> <p>The administrative expense assumption is based on information relating to the System's administrative expenses provided by the Retirement System.</p>

SECTION 7 - PLAN MEMBER INFORMATION

Exhibit 7.1 - Active Members by Age and Years of Service as of January 1, 2016

Age	Years of Service									Total
	<u>0 to 4</u>	<u>5 to 9</u>	<u>10 to 14</u>	<u>15 to 19</u>	<u>20 to 24</u>	<u>25 to 29</u>	<u>30 to 34</u>	<u>35 to 39</u>	<u>40 & up</u>	
Under 20	3	-	-	-	-	-	-	-	-	3
	22,858	-	-	-	-	-	-	-	-	22,858
20-24	252	1	-	-	-	-	-	-	-	253
	27,178	48,889	-	-	-	-	-	-	-	27,264
25 to 29	424	50	-	-	-	-	-	-	-	474
	31,440	41,709	-	-	-	-	-	-	-	32,523
30 to 34	252	134	65	3	1	-	-	-	-	455
	35,465	52,957	53,431	74,877	48,552	-	-	-	-	43,472
35 to 39	223	107	96	43	2	-	-	-	-	471
	35,854	47,762	58,848	64,638	79,755	-	-	-	-	46,060
40 to 44	336	131	122	128	34	-	1	-	-	752
	30,187	45,873	56,228	63,824	71,260	-	56,326	-	-	44,762
45 to 49	354	239	166	132	86	43	6	-	-	1,026
	32,097	34,238	46,107	54,275	77,665	77,488	73,642	-	-	43,681
50 to 54	291	233	254	204	77	93	33	4	-	1,189
	32,241	32,118	40,330	45,225	64,362	72,200	77,247	51,443	-	42,692
55 to 59	153	209	255	256	107	74	53	25	-	1,132
	32,353	33,021	39,328	41,357	47,098	62,759	69,946	70,895	-	42,076
60 to 64	87	104	145	152	108	64	44	23	6	733
	37,640	36,680	39,752	40,895	42,915	50,735	63,221	69,198	80,493	43,394
65 to 69	21	25	36	40	31	31	13	3	3	203
	31,986	31,650	33,858	38,525	42,112	45,116	35,397	44,016	62,044	37,957
70 & up	6	12	11	15	10	9	7	7	5	82
	26,670	23,912	29,110	34,954	32,910	40,759	37,631	39,338	31,106	32,704
Total	2,402	1,245	1,150	973	456	314	157	62	14	6,773
Average Salary	32,108	38,402	44,532	47,721	56,085	62,749	65,349	64,147	58,901	41,771
Average Age:							48.0	Average Service:		10.6

Worcester Regional Retirement System
Actuarial Valuation as of January 1, 2016

SECTION 7 - PLAN MEMBER INFORMATION

Exhibit 7.2 - Retired Plan Members and Beneficiaries Annual Pensions as of January 1, 2016

Attained Age	Male		Female		Total	
	Count	Total Payments	Count	Total Payments	Count	Total Payments
<20	1	22,540	1	8,730	2	31,270
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	0	0	0	0	0	0
35-39	0	0	1	19,635	1	19,635
40-44	1	20,771	2	20,427	3	41,198
45-49	7	133,842	9	168,781	16	302,623
50-54	11	412,619	14	222,225	25	634,844
55-59	94	3,503,613	80	1,035,631	174	4,539,244
60-64	153	5,282,971	231	3,364,414	384	8,647,385
65-69	278	8,751,074	376	6,755,183	654	15,506,257
70-74	202	5,219,806	355	5,753,299	557	10,973,105
75-79	162	3,542,673	278	4,044,639	440	7,587,312
80-84	107	2,036,317	232	3,057,946	339	5,094,263
85-89	83	1,495,538	206	2,122,753	289	3,618,291
90-94	39	503,824	146	1,263,844	185	1,767,668
95+	8	89,285	45	308,232	53	397,517
Total	1,146	31,014,873	1,976	28,145,739	3,122	59,160,612
Average Age	72.0		74.9		73.8	
Average Payment		27,064		14,244		18,950
	36.7%	52.4%	63.3%	47.6%	100.0%	100.0%

Included in above totals is \$465,830 in State reimbursed COLAs.

SECTION 7 - PLAN MEMBER INFORMATION

Exhibit 7.3 - Disabled Plan Members Annual Pensions as of January 1, 2016

Attained Age	Male		Female		Total	
	Count	Total Payments	Count	Total Payments	Count	Total Payments
<20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	1	46,495	0	0	1	46,495
35-39	2	99,120	1	22,241	3	121,361
40-44	9	350,333	2	93,453	11	443,786
45-49	14	544,988	2	34,870	16	579,858
50-54	25	813,929	7	175,677	32	989,606
55-59	27	997,964	15	382,378	42	1,380,342
60-64	46	1,545,152	8	113,822	54	1,658,974
65-69	37	1,186,215	2	12,464	39	1,198,679
70-74	21	646,497	5	133,081	26	779,578
75-79	14	330,767	2	25,337	16	356,104
80-84	12	298,506	4	93,458	16	391,964
85-89	2	43,235	1	20,521	3	63,756
90-94	1	15,108	0	0	1	15,108
95+	0	0	0	0	0	0
Total	211	6,918,309	49	1,107,302	260	8,025,611
Average Age	62.9		61.5		62.6	
Average Payment		32,788		22,598		30,868
	81.2%	86.2%	18.8%	13.8%	100.0%	100.0%

Included in above totals is \$74,425 in State reimbursed COLAs.

SECTION 8 - GLOSSARY OF TERMS

Actuarial Accrued Liability – That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

Actuarial Assumptions – Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the commencement, amount and duration of pension benefits, such as: changes in compensation, mortality, withdrawal, disablement and retirement; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

Actuarial Cost Method (or Funding Method) – A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the current year (Normal Cost) and the past (Actuarial Accrued Liability).

Actuarial Gain or Loss (or Experience Gain or Loss) – A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between the valuation date and the most recent immediately preceding valuation date.

Actuarial Present Value – The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

Amortization Payment – That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

Annual Statement – The statement submitted by the local retirement board to PERAC each year that describes the asset holdings and Fund balances as of December 31 and the transactions during the calendar year that affected the financial condition of the retirement system.

Annuity Reserve Fund – The fund into which total accumulated Member Contributions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

Annuity Savings Fund – The fund in which Member Contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).

Assets – The total value of the investments held by the Plan trust that are for the payment of promised benefits.

Cost of Benefits – The estimated payment from the pension system for benefits for the fiscal year.

Expense Fund – The fund into which the appropriation for administrative expenses is paid and from which all such expenses are paid.

SECTION 8 - GLOSSARY OF TERMS

Funded Ratio – The Actuarial Value of Assets expressed as a percentage of the Actuarial Accrued Liability.

Funding Schedule – The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22D of M.G.L. Chapter 32.

GASB – Governmental Accounting Standards Board.

Normal Cost – Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is expected to accrue in the current fiscal year. The Employee Normal Cost is the amount of the expected Member Contributions for the current fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

Pension Fund – The fund into which appropriation amounts as determined by PERAC are paid and from which pension benefits are paid.

Pension Reserve Fund – The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

Present Value of Future Benefits – The actuarial present value of the cost to finance benefits payable in the future, discounted to reflect the expected effects of the time value of money and the probabilities of payment.

Special Fund for Military Service Credit – The fund which is credited with amounts paid by the retirement board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the retirement board. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

Total Pension Liability – The portion of the Actuarial Present Value attributable to past service in accordance with the Entry Age cost method as stipulated by GASB Statement Number 67 (GASB 67).

Unfunded Actuarial Accrued Liability – The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.

SECTION 9 - MEMBER UNIT FY2018 APPROPRIATION

Unit	Unit Name	FYE2018 Appropriation						FYE2017	Increase over	Payment on
		Normal Cost	UAL	2002 ERI	2003 ERI	2010 ERI	Total	Appropriation	FYE 2017	7/1/2017
010	Ashburnham	274,552	381,937	29,387	-	-	685,876	615,826	11.37%	673,313
020	Ashburnham-Westminster Regional	245,870	313,648	-	-	-	559,518	503,888	11.04%	549,269
025	Athol	352,411	862,155	-	-	-	1,214,566	-	0.00%	1,192,319
026	Athol Housing Authority	10,390	24,512	-	-	-	34,902	-	0.00%	34,263
027	Athol-Royalston Regional School District	180,238	306,725	-	-	-	486,963	-	0.00%	478,043
030	Auburn	1,053,249	1,442,523	161,867	25,114	-	2,682,753	2,391,447	12.18%	2,633,613
040	Auburn Housing Authority	23,280	32,253	-	-	-	55,533	50,877	9.15%	54,516
050	Auburn Water District	25,151	57,445	4,817	-	-	87,413	86,112	1.51%	85,812
060	Barre	111,912	152,764	5,300	2,120	-	272,096	250,016	8.83%	267,112
070	Barre Housing Authority	3,423	10,217	-	-	-	13,640	12,298	10.91%	13,390
080	Berlin	179,895	247,617	-	-	-	427,512	379,337	12.70%	419,681
090	Berlin-Boylston Regional	47,838	65,945	-	-	-	113,783	103,720	9.70%	111,699
100	Blackstone	274,029	404,587	-	-	-	678,616	595,993	13.86%	666,186
105	Blackstone Housing Authority	9,611	7,491	-	-	-	17,102	14,307	19.54%	16,789
110	Blackstone-Millville Regional	190,814	263,096	-	-	-	453,910	452,853	0.23%	445,596
120	Bolton	156,129	209,879	15,899	-	-	381,907	346,145	10.33%	374,912
130	Boylston	275,935	278,148	12,044	-	-	566,127	476,634	18.78%	555,757
135	Boylston Water District	2,848	6,518	-	-	-	9,366	7,869	19.02%	9,194
140	Brookfield	109,952	133,672	8,029	-	-	251,653	220,411	14.17%	247,043
150	Charlton	447,227	594,584	41,110	-	-	1,082,921	1,012,691	6.93%	1,063,085
160	Cherry Valley-Rochdale Water	5,621	35,054	-	-	-	40,675	40,165	1.27%	39,930
165	Cherry Valley Sewer District	-	1,519	-	-	-	1,519	-	0.00%	1,491
170	Douglas	431,571	477,353	11,560	11,089	-	931,573	824,690	12.96%	914,509
180	Dudley	218,097	397,776	122,846	7,339	-	746,058	747,092	-0.14%	732,393
190	Dudley Housing Authority	-	12,176	-	-	-	12,176	22,278	-45.35%	11,953
200	Dudley-Charlton Regional	324,556	482,783	37,735	16,471	-	861,545	818,242	5.29%	845,764
210	East Brookfield	70,022	59,385	-	-	-	129,407	99,043	30.66%	127,037
220	Grafton	610,568	891,877	37,094	15,981	-	1,555,520	1,473,835	5.54%	1,527,028
230	Grafton Housing Authority	23,936	22,362	-	-	-	46,298	45,895	0.88%	45,450
240	Hardwick	58,334	103,445	12,205	-	-	173,984	193,088	-9.89%	170,797
250	Harvard	285,946	484,963	-	-	-	770,909	751,999	2.51%	756,788
260	Hillcrest Water District	597	1,978	-	-	-	2,575	8,512	-69.75%	2,528

Worcester Regional Retirement System
Actuarial Valuation as of January 1, 2016

SECTION 9 - MEMBER UNIT FY2018 APPROPRIATION

Unit	Unit Name	FYE2018 Appropriation						FYE2017	Increase over	Payment on
		Normal Cost	UAL	2002 ERI	2003 ERI	2010 ERI	Total	Appropriation	FYE 2017	7/1/2017
270	Holden	658,780	1,193,615	60,861	-	-	1,913,256	1,913,183	0.00%	1,878,211
280	Holden Housing Authority	14,378	12,253	-	-	-	26,631	26,579	0.20%	26,143
290	Hopedale	392,824	455,890	-	-	-	848,714	761,930	11.39%	833,168
300	Hopedale Housing Authority	-	4,348	-	-	-	4,348	6,751	-35.59%	4,268
310	Hubbardston	104,444	120,587	9,634	4,076	-	238,741	213,907	11.61%	234,368
320	Lancaster	209,664	308,699	-	-	-	518,363	497,350	4.22%	508,868
325	Lancaster Housing Authority	5,297	8,100	-	-	-	13,397	8,472	58.13%	13,152
330	Leicester	392,483	632,330	48,334	1,958	-	1,075,105	1,043,974	2.98%	1,055,412
340	Leicester Housing Authority	10,263	24,063	-	-	-	34,326	35,597	-3.57%	33,697
350	Leicester Water District	9,513	35,258	-	-	-	44,771	47,164	-5.07%	43,951
360	Lunenburg	431,376	696,261	-	-	-	1,127,637	1,072,029	5.19%	1,106,982
370	Lunenburg Housing Authority	1,088	197	-	-	-	1,285	3,702	-65.29%	1,261
380	Lunenburg Water District	5,245	38,753	-	-	-	43,998	47,022	-6.43%	43,192
390	Mendon	215,766	284,894	7,708	20,709	-	529,077	467,870	13.08%	519,386
400	Mendon-Upton Regional	302,717	345,246	6,424	7,173	-	661,560	620,850	6.56%	649,442
410	Millbury	563,143	926,223	131,194	-	-	1,620,560	1,542,991	5.03%	1,590,876
420	Millbury Housing Authority	31,284	45,350	-	5,872	-	82,506	79,509	3.77%	80,995
430	Millville	111,956	36,326	-	-	-	148,282	120,768	22.78%	145,566
440	Narragansett Regional	122,836	197,667	22,642	-	-	343,145	344,269	-0.33%	336,860
450	Nashoba Regional	433,118	479,742	-	-	-	912,860	783,696	16.48%	896,139
460	New Braintree	13,267	32,000	-	-	-	45,267	62,451	-27.52%	44,438
470	Northboro	565,521	1,165,295	-	-	-	1,730,816	1,644,972	5.22%	1,699,113
480	Northboro Housing Authority	23,839	32,856	-	-	-	56,695	51,256	10.61%	55,657
490	Northboro-Southboro Regional	163,992	166,511	-	-	-	330,503	282,183	17.12%	324,449
500	North Brookfield	141,712	236,939	-	13,208	-	391,859	393,681	-0.46%	384,681
510	North Brookfield Housing Authority	1,964	14,108	-	-	-	16,072	15,252	5.38%	15,778
530	Oakham	25,963	33,579	-	-	-	59,542	67,235	-11.44%	58,451
540	Oxford	612,791	984,434	125,413	14,187	-	1,736,825	1,785,719	-2.74%	1,705,012
550	Oxford Housing Authority	18,825	33,325	-	-	-	52,150	51,526	1.21%	51,195
555	Oxford-Rochdale Sewer District	8,641	18,369	-	-	-	27,010	18,121	49.05%	26,515
560	Paxton	288,089	321,788	-	-	-	609,877	490,595	24.31%	598,706
570	Petersham	63,103	73,229	-	2,120	-	138,452	135,553	2.14%	135,916

Worcester Regional Retirement System
Actuarial Valuation as of January 1, 2016

SECTION 9 - MEMBER UNIT FY2018 APPROPRIATION

Unit	Unit Name	FYE2018 Appropriation						FYE2017	Increase over	Payment on
		Normal Cost	UAL	2002 ERI	2003 ERI	2010 ERI	Total	Appropriation	FYE 2017	7/1/2017
580	Phillipston	54,659	58,072	-	-	-	112,731	111,678	0.94%	110,666
590	Princeton	84,824	230,659	7,708	-	-	323,191	332,680	-2.85%	317,271
600	Quabbin Regional	321,606	497,807	48,816	7,173	-	875,402	869,089	0.73%	859,367
610	Quaboag Regional	111,993	166,809	28,261	-	-	307,063	298,626	2.83%	301,439
620	Royalston	15,747	31,517	-	-	-	47,264	50,567	-6.53%	46,398
630	Rutland	237,927	277,378	5,783	-	-	521,088	440,118	18.40%	511,543
640	Southboro	643,325	998,460	-	-	-	1,641,785	1,561,276	5.16%	1,611,713
650	Southboro Housing	4,150	(125)	10,116	-	-	14,141	13,618	3.84%	13,882
660	Spencer	303,922	472,678	-	-	-	776,600	707,661	9.74%	762,375
670	Spencer-East Brookfield Regional	187,422	310,338	21,839	3,749	-	523,348	500,749	4.51%	513,762
680	Spencer Housing Authority	9,832	25,667	-	-	-	35,499	36,779	-3.48%	34,849
690	Sterling	366,719	483,631	-	12,883	-	863,233	805,874	7.12%	847,421
700	Sterling Housing Authority	4,502	3,665	-	-	-	8,167	7,507	8.79%	8,017
710	Sturbridge	549,608	584,802	-	58,707	-	1,193,117	1,079,957	10.48%	1,171,263
720	Sutton	378,301	606,421	-	-	-	984,722	934,406	5.38%	966,685
730	Tantasqua Regional	270,367	314,350	-	-	-	584,717	551,635	6.00%	574,007
740	Templeton	236,931	423,347	19,751	-	-	680,029	676,348	0.54%	667,573
750	Templeton Housing Authority	5,999	11,780	19,589	-	-	37,368	36,307	2.92%	36,684
760	Upton	201,617	319,297	-	-	-	520,914	458,640	13.58%	511,372
770	Uxbridge	543,356	984,114	68,086	-	-	1,595,556	1,552,552	2.77%	1,566,330
780	Uxbridge Housing Authority	11,100	31,481	-	-	-	42,581	52,217	-18.45%	41,801
790	Wachusett Regional	832,619	824,893	52,189	-	-	1,709,701	1,453,164	17.65%	1,678,385
800	Warren	132,450	150,272	48,495	-	5,769	336,986	291,004	15.80%	330,813
810	Warren Water District	7,323	7,036	-	-	-	14,359	11,846	21.21%	14,096
820	Westboro	1,258,834	2,165,931	-	32,615	-	3,457,380	3,322,520	4.06%	3,394,054
825	Westboro Housing Authority	12,078	17,041	4,655	-	-	33,774	29,909	12.92%	33,155
830	West Boylston	445,247	577,274	55,242	-	-	1,077,763	1,018,768	5.79%	1,058,022
835	West Boylston Housing Authority	1,689	7,519	-	-	-	9,208	10,318	-10.76%	9,039
840	West Boylston Water District	13,397	33,100	-	-	-	46,497	45,198	2.87%	45,645
850	West Brookfield	117,847	119,584	-	-	-	237,431	229,946	3.26%	233,082
860	Westminster	277,448	466,867	-	4,566	-	748,881	720,330	3.96%	735,164
870	Winchendon	437,314	805,206	55,401	-	-	1,297,921	1,347,215	-3.66%	1,274,147

Worcester Regional Retirement System
Actuarial Valuation as of January 1, 2016

SECTION 9 - MEMBER UNIT FY2018 APPROPRIATION

Unit	Unit Name	FYE2018 Appropriation						FYE2017	Increase over	Payment on
		Normal Cost	UAL	2002 ERI	2003 ERI	2010 ERI	Total	Appropriation	FYE 2017	7/1/2017
880	Winchendon Housing Authority	29,014	50,705	4,335	-	-	84,054	74,685	12.54%	82,514
Total		20,057,051	29,782,198	1,362,369	267,110	5,769	51,474,497	46,814,607	9.95%	50,531,642